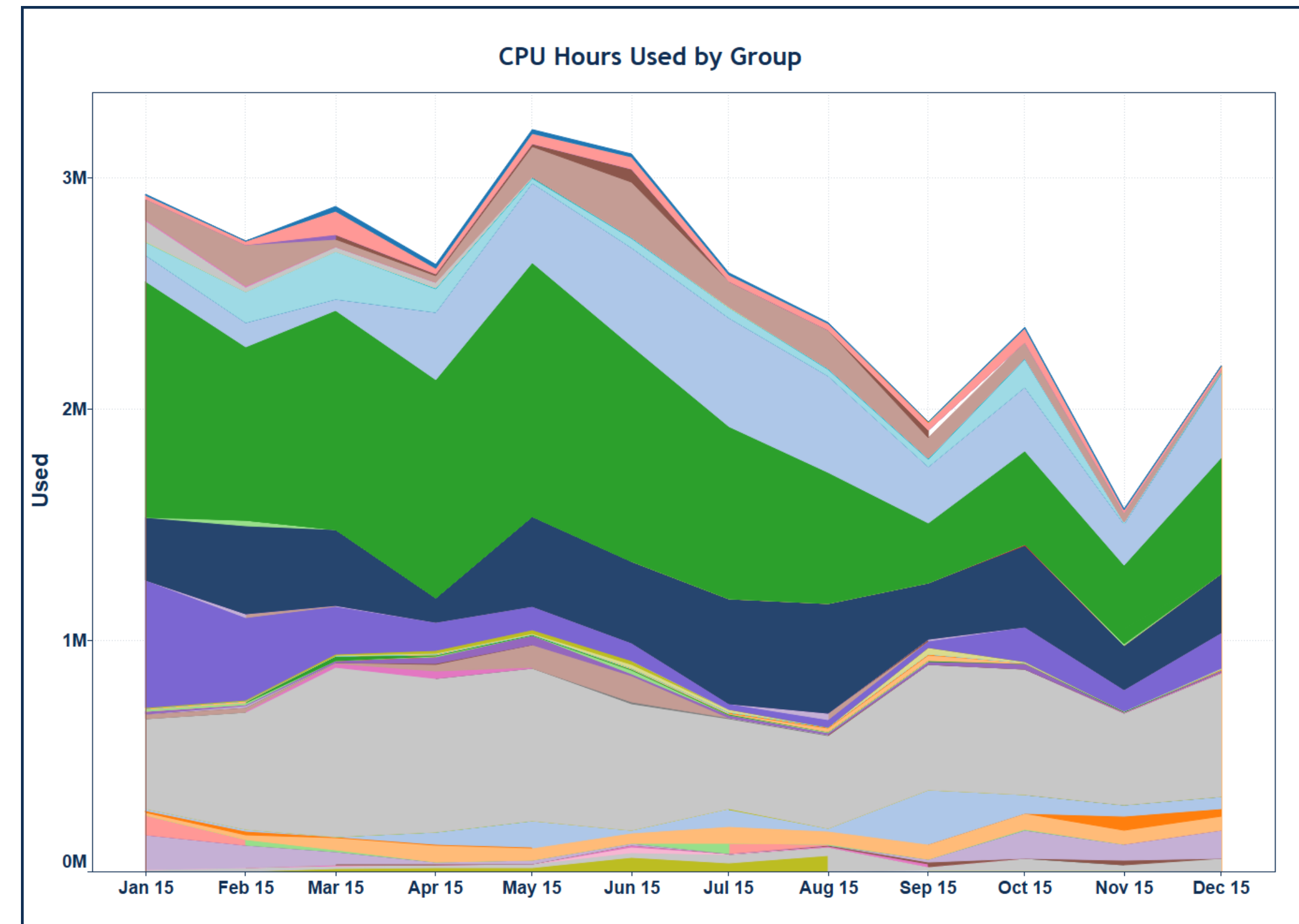


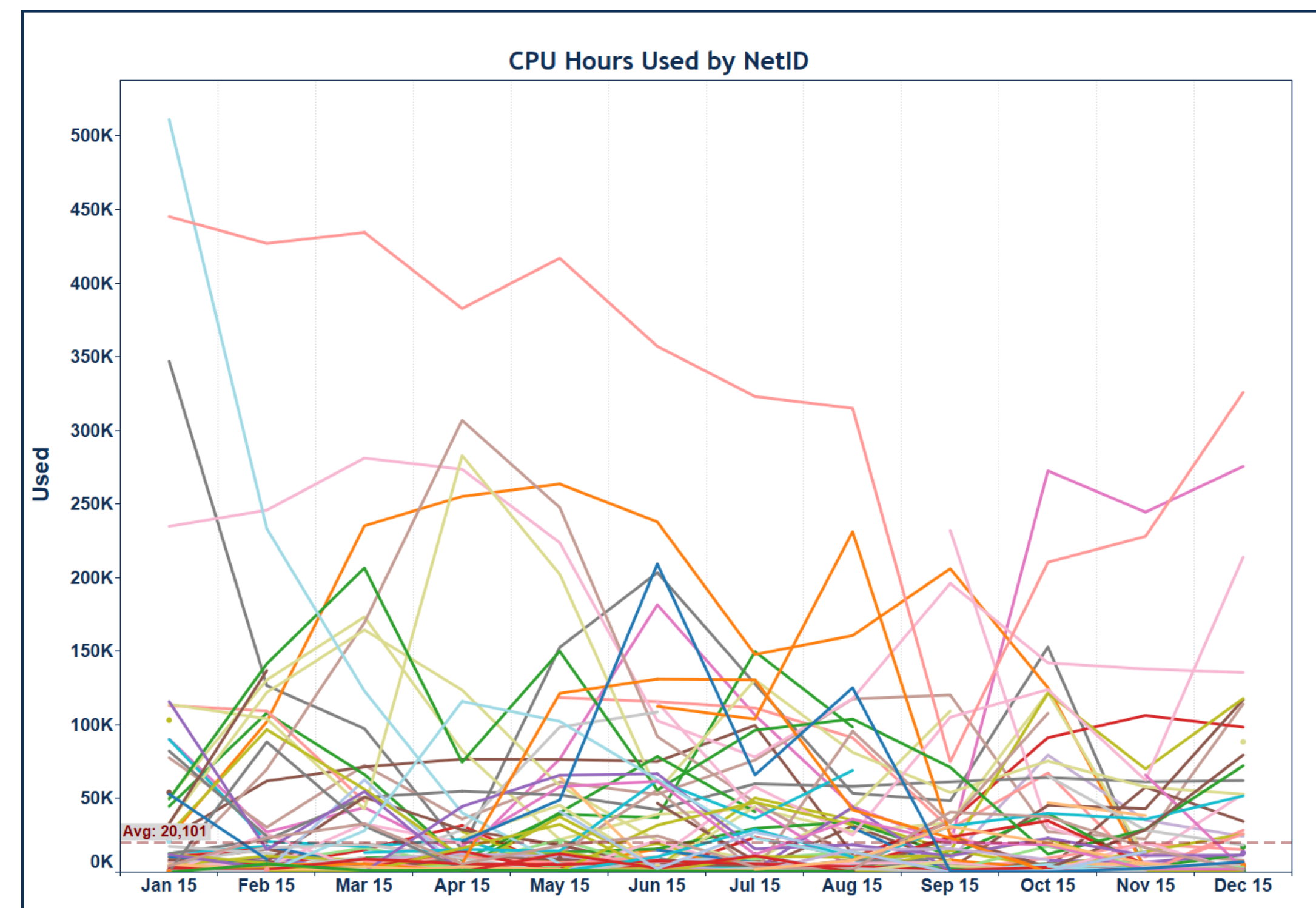
Susan Starnes<sup>1</sup>, Francisco Mejia<sup>2,1</sup>, Tom Milledge<sup>1</sup>, Mark DeLong<sup>1</sup>

<sup>1</sup> – Duke University Office of Information Technology, <sup>2</sup> – North Carolina Central University

A



B



## "It all comes out in the wash"

The cluster operates on the "condo" model, allowing researchers to use other researchers' machines at low priority (yielding to the buyer's use) as a "common partition" resource. The arrangement provides researchers intermittent bursts of compute power and dedicated cycles from purchased equipment (their "high-priority" use). This generally increases the overall average use of the computational power of the combined computers.

**A. "Stacked" usage by group** shows variability of usage over 2015.

**B. Individual's use over 2015.** Patterns often show intermittent use, which allows for an averaging of overall use.

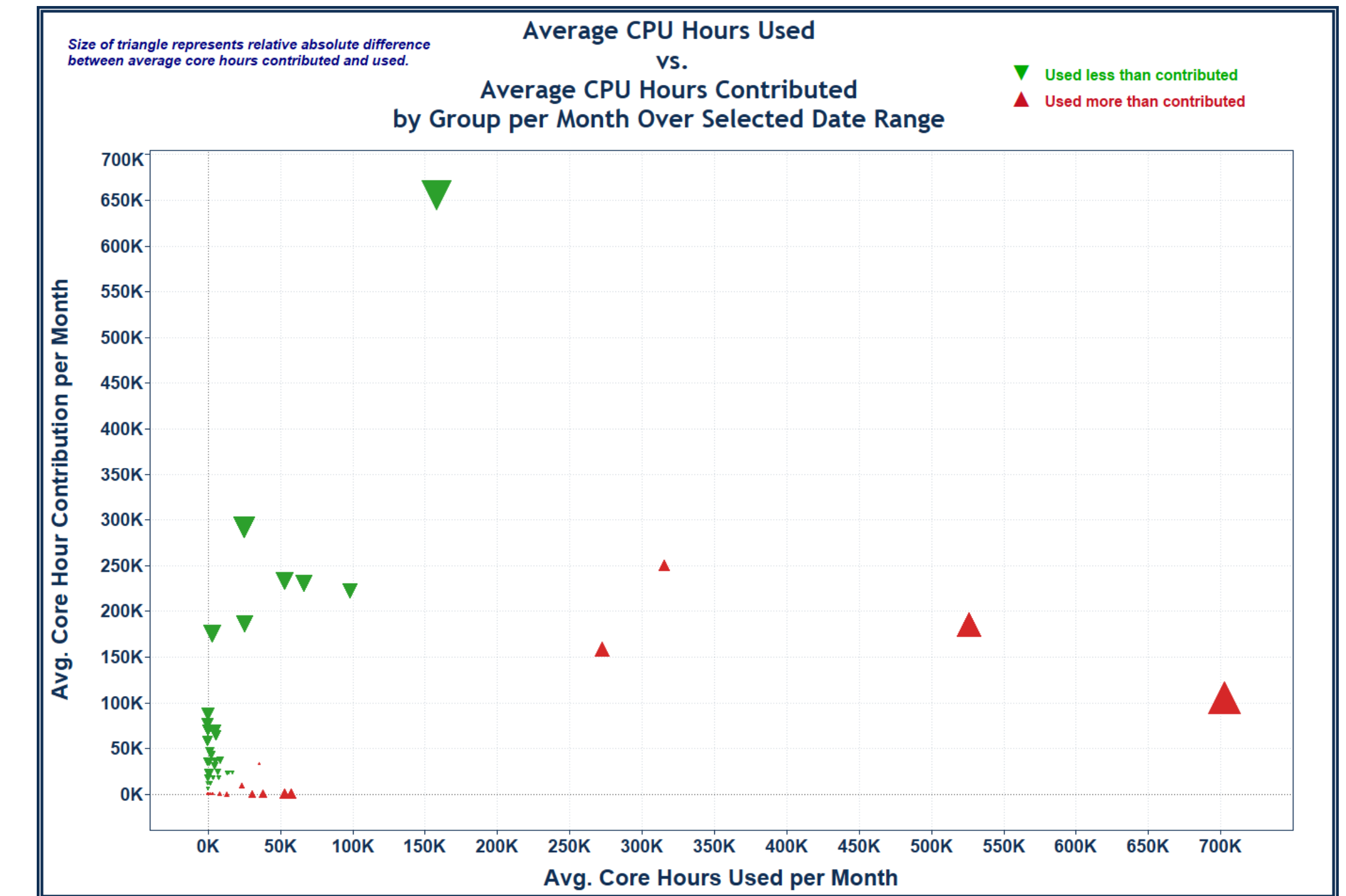
## Data & automation

Data for groups and users was captured using SLURM `sreport`. After we finalized visualization using Tableau (<http://www.tableau.com/>), we automated data capture with Pentaho (<http://www.pentaho.com/>) which updates data on a monthly basis. Tableau automatically renders new report graphs.

## Finding balance

The framework of the cluster evens out the intermittent usage of many users, but requires a long-term balance of *contributed* and *consumed* cycles. That balance can be improved using data from the project by identifying groups with unbalanced usage.

C



**C. Comparison of use v. contributions** shows the balance of contribution and consumption. **Red** indicates higher consumption; **green**, higher contribution.

## Future directions

- **Deploy dashboard** for groups to see compute cycle use
- **Improve balance** of use to contributions
- Deploy **Open Science Grid** to harvest unused cycles
- **Add metrics** for "cloud bursting" (AWS & Azure)
- Create similar **system for storage**

Every month, Duke researchers use a combined **290 CPU-years** of cluster computation.